

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
22 August 2002 (22.08.2002)

PCT

(10) International Publication Number
WO 02/065802 A1

(51) International Patent Classification⁷: **H04Q 7/38**

[DE/DE]; Stuttgarter Str. 53, 71522 Backnang (DE).
BELLORA, Mauro [IT/IT]; Via F. Filzi 16 A, I-21013
Gallarate (IT). **BASERGA, Aldo** [IT/IT]; Via E. Fermi 9,
I-22038 Tavernerio (IT).

(21) International Application Number: **PCT/EP02/01598**

(74) Agent: **TONSCHEIDT, Andreas**; Ericsson Eurolab
Deutschland GmbH, Ericsson Allee 1, 52134 Herzogenrath (DE).

(22) International Filing Date: 14 February 2002 (14.02.2002)

(81) Designated States (*national*): AE, AG, AL, AM, AT, AU,
AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU,
CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH,
GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC,
LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW,
MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SD, SE, SG,
SI, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ,
VN, YU, ZA, ZM, ZW.

(25) Filing Language: English

(84) Designated States (*regional*): ARIPO patent (GH, GM,
KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW),

(26) Publication Language: English

(30) Priority Data:
01103399.0 14 February 2001 (14.02.2001) EP

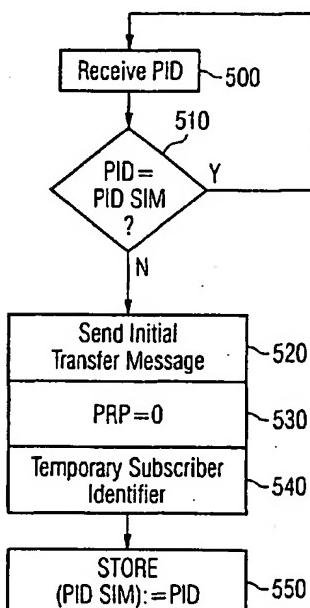
(71) Applicant (*for all designated States except US*): TELEFONAKTIEBOLAGET LM ERICSSON (publ)
[SE/SE]; S-126 25 Stockholm (SE).

(72) Inventors; and

(75) Inventors/Applicants (*for US only*): TURINA, Klaus

[Continued on next page]

(54) Title: SIGNALLING CONNECTION TO A POOL OF NETWORK ELEMENTS



(57) Abstract: The invention relates to a method of supporting the set-up of a signalling connection of a user equipment to a mobile communications network, wherein a radio network element broadcasts a pool identifier identifying a pool of network elements, furthermore to a method of setting-up a signalling connection by a user equipment to a mobile communications network. The user equipment receives a first pool identifier identifying a pool of network elements of the communications network, compares it with a second pool identifier and sends an initial transfer message comprising a pool registration parameter to a radio network element of the mobile communications network. The invention relates further to a method of setting up a signalling connection by the radio network element to a pool network element by determining said element. The invention relates further to corresponding computer programs, radio network elements and user equipment.

PID=PIDSIM?	PRP	Pool registration status
NO	0	Not registered
YES	1	— Already registered

560

WO 02/065802 A1



Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

- with international search report

— before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

Signalling connection to a pool network element

The invention addresses the field of mobile communications. It relates to a method, device and computer program for determining in a mobile communications network

- 5 a network element of a pool of network elements for service provisioning.

Technological background of the invention

Both circuit switched and packet switched mobile communications networks like

GSM, GPRS and UMTS provide methods for location management. In circuit

- 10 switched domains so-called location areas are defined. Routing areas are defined in addition in packet switched domains. Known methods of location management are the so-called location area or routing area update procedures, wherein a mobile terminal of the communications network requests a location / routing area update, e.g., if it recognises that it has moved from one location /routing area of the network
- 15 to another. Details about location / routing area update procedures can be found in 3GPP-TS 23.012 V 3.3.0 and 3GPP-TS 24.008 V 3.6.0.

In order to allow the mobile terminal to detect a change of the location / routing area, a location area identifier LAI, or routing area identifier RAI respectively, is

- 20 broadcasted regularly within said location area or routing area by the base station system serving this area. The base station system of the 2nd generation systems like GSM is represented by a base station controller BSC in the following, of the 3G systems like UMTS by the radio network controller RNC respectively. As defined in 3GPP-TS 23.003 V 3.7.0 a LAI consists of a mobile country code MCC, a mobile network code MNC and a location area code LAC. The latter identifies the location area. A RAI consists in addition of a routing area code RAC identifying the routing area.

As described in 3GPP-TS24.008 the mobile terminal checks, whether the currently

- 30 received LAI/RAI corresponds to its stored, last known LAI/RAI and sends a

location area update request or routing area update request to the network if there is any discrepancy.

- In any case the mobile terminal contacts the network, it identifies itself by means of
- 5 a temporary mobile subscriber identity TMSI in the circuit switched domain, or by means of a packet temporary mobile subscriber identity P-TMSI in the packet domain. The TMSI is assigned to the mobile terminal by its serving mobile switching centre/visited location register MSC/VLR. The P-TMSI is assigned by a serving GPRS support node SGSN. Each temporary identity is assigned uniquely
- 10 within a location area.

The TMSI/P-TMSI has a fixed length of 32 bit. It consists of subscriber address bits identifying an address of the subscriber record in the MSC/VLR or SGSN, of reserved bits needed for reallocation purposes like restart counters etc., and two

15 domain identifier bits indicating whether the subscriber identity is a TMSI or a P-TMSI.

- In order to identify itself towards the network, e.g. in the case of location / routing area update request, the mobile terminal sends the TMSI/P-TMSI together with an
- 20 information, in which location area or routing area this temporary identifier has been assigned. The BSC/RNC receiving these information transmits them to the serving MSC/VLR or SGSN. Based on these information the MSC/VLR or SGSN determines whether it already serves the mobile terminal, or whether it has to require any data from a formerly serving MSC/VLR or SGSN or from a home
- 25 location register HLR. When the required data are available at the MSC/VLR or SGSN, the MSC/VLR or SGSN can serve the mobile terminal, e.g. by performing a location update procedure.

- The current architecture of mobile communications networks provides one
- 30 MSC/VLR or SGSN serving a location area or routing area. Each BSC or RNC has a uniquely assigned serving MSC/VLR or SGSN. The BSC or RNC clearly knows,

to which MSC/VLR or SGSN any messages sent from a mobile terminal are to be transmitted.

The increasing demand on mobile communications services requires new measures
5 regarding load distribution and service availability in order to cope with the increasing traffic volume. It is the aim to provide at each MSC/VLR or SGSN the same quality of service. The introduction of MSC/VLR pools or SGSN pools in mobile communications networks can fulfil the outlined demands. By applying to the pool concept, each MSC/VLR or SGSN within a pool is serving the same
10 service area, so-called MSC/SGSN pool service area. Each of the BSCs or RNCs within the MSC/SGSN pool service area can be logically connected to each MSC/VLR or SGSN within the pool. Nevertheless, a mobile terminal shall be served within a pool service area by the same MSC/VLR or SGSN of the pool as long as it roams within the pool service area to avoid unnecessary signalling traffic
15 and delays caused by changing the MSC/VLR or SGSN.

The introduction of the pool concept calls off the unique assignment of a serving MSC/VLR or SGSN to a BSC or RNC. Therefore, the BSC or RNC does not know to which MSC/VLR or SGSN messages received from a mobile terminal are to be
20 transmitted.

Summary of the invention

It is therefore an object of the present invention to improve the routing of information from a user equipment via a radio network element to a pool network
25 element serving the user equipment.

This is solved by the teaching of the independent claims.

In order to support the set-up of a signalling connection of a user equipment, e.g. a
30 mobile phone, a laptop or a video terminal, to a mobile communications network, e.g. a GSM, GPRS or UMTS network, broadcasts a radio network element, e.g. a

BSC or a RNC, of the network in a dedicated area a location information, which comprises a mobile country code, a mobile network code and an area identifier. The location information comprises further at least one pool identifier identifying at least one pool of network elements serving the area.

5

Advantageously, the pool identifier can be broadcasted within the already defined broadcast information location area information LAI in the circuit switched domain and within the routing area information RAI in the packet domain. The overall format of said messages remains unchanged. Therefore, without being limited to the above mentioned systems, the invention requires only minor changes for them while guarantying a maximum compatibility with already existing or designed systems using the known LAI or RAI.

The user equipment determines based on the received pool identifier a pool registration parameter that indicates, whether the user equipment is already served, i.e. registered, at the corresponding pool of network elements. The user equipment can send in all cases, wherein it contacts the mobile communications network, the pool registration parameter in an initial transfer message to the BSC or RNC, i.e. the user equipment can inform in all cases it identifies itself towards the network the BSC/RNC about its pool registration status.

Advantageously, this can be done for the systems mentioned above – without being limited to them – within the already defined so-called initial direct transfer message, which requires if used as the initial transfer message of the invention only minor changes, and thus provides maximum compatibility with already existing or designed systems and user equipment. Furthermore, the pool registration indicator requires just one bit for its representation, which is very resource-efficient in particular with respect to the limited resources of the air interface.

When a radio network element receives an initial transfer message, it uses the pool registration parameter value for the determining of the pool network element, to

- which the routing of at least some information given in the initial transfer message is performed. One possibility to determine the appropriate pool network element if the pool registration parameter value indicates that the user equipment is already registered at the pool can be a retrieval of the appropriate address from a pool controller. Alternatively, a lookup table provided at the radio network element might be used. Advantageously, the initial transfer message can terminate at the radio network element. Only information relevant for the pool network element is necessary to be routed.
- 10 The invention is for implementation in a radio network element like a BSC, RNC or a separate network node. It might be represented by a pure server implementation. The radio network element realising the routing function can be implemented in a pool controller located at the pool of network elements, at a BSC or RNC or stand-alone. Therefore, the invention provides good flexibility with regards to possible implementations.
- 15 The user equipment can be any terminal like a GSM-, GPRS- or UMTS-phone, - laptop or -adapter. Furthermore, the invention can be realised by a computer program, which is loadable into the internal memory of a digital processing unit,
- 20 comprising software code portions adapted to control the steps of the described methods, when the computer program is executed on the digital processing unit. Therefore, servers representing network elements according to the present invention can easily be adapted to the inventive function.
- 25 Advantageously, the invention allows for the use of a pool of network elements in a mobile communications network, and therefore supports load distribution and redundancy measures based on a pool concept in the network. It allows for the provisioning of a good quality of service level within the whole network.
- 30 Preferred embodiments of the invention are described in the dependent claims.

In a preferred embodiment, the appropriate network element of the pool can be chosen by the radio network element itself, e.g. by means of a load sharing algorithm, per default choice, randomly or by a round robin algorithm if the pool registration parameter value indicates that the user equipment is not registered at the 5 pool. This provides for an operator of the network a high flexibility in the used choice-strategy. Furthermore, there is no need to evaluate any network element identifier that might be provided.

In one preferred embodiment sends the user equipment a network element identifier 10 that identifies a dedicated network element, at which the user equipment is registered, wherein the dedicated network element is identified uniquely within the pool of network elements. In one embodiment the radio network element has to consider only this network element identifier, if the pool registration parameter value indicates a registration, in order to determine the appropriate network element 15 of the pool. Thus, maximum efficiency is provided.

The network element identifier can be provided within the already known TMSI or P-TMSI without changes of their overall formats, i.e. of their overall lengths.

20. In a preferred embodiment the computer program is stored on a computer readable medium like a CD-ROM, a floppy disc, optical disc or hard disk. Therefore, a good physical portability of the control software is provided, i.e. upgrades can be performed in an easy way.
25. In the following, the invention is described in detail with reference to the figures.

Brief description of the figures:

- Fig. 1 shows a simplified mobile communications network,
30 Fig. 2 shows in a message diagram a set-up of a signalling connection,

Fig. 3a shows a structure of a location information in a circuit switched domain,

Fig. 3b shows a structure of a location information in a packet switched domain,

5 Fig. 4 shows a structure of a temporary subscriber identifier,

Fig. 5 shows in a flow diagram a set-up of a signalling connection by a user equipment, and

Fig. 6 shows in a flow diagram a set-up of a signalling connection by a radio network element.

10

Detailed description

- Fig. 1 shows a simplified mobile communications network 170 and a user equipment 160, e.g. a mobile terminal. The figure shows those elements of the network, which are necessary for the understanding of the invention. The network 15 comprises a pool 100 of network elements 110, 115. Such network elements are e.g. in a circuit switching network MSC/VLR nodes or in a packet switching network SGSN nodes. The network elements 110, 115 of the pool 100 can be connected to each other, and they can be connected to a pool controller (not shown in the figure). The network elements 110, 115 of the pool 100 perform e.g. switching tasks in the 20 network and service provisioning to the user equipment 160. The pool 100 can comprise a plurality of network elements. Furthermore, the mobile communications network 170 can comprise a plurality of pools. The network elements of the pool can have different processing capacities and can provide different services.
- 25 The coverage of the mobile communications network 170 is divided into a plurality of locations areas 120, 130, 140. In the packet switched domain, a location area can be subdivided into routing areas (not shown in the figure). Each location area is served by at least one radio network element 150, 153, 156. A radio network element can be e.g. in GSM systems a base station controller BSC or in UMTS 30 systems a radio network controller RNC connected to a plurality of base transceiver

stations BTS. In another embodiment, the radio network element refers to a base transceiver station BTS itself.

The radio network elements 150, 153, 156 are connected to more than one network element of the pool 100. In figure 1, each radio network element is connected with each network element of the pool (called as well pool network element in the following). In an alternative embodiment, the radio network elements are connected to the pool network elements via a pool controller (not shown in the figure).

- 5 Fig. 2 illustrates simplified a set-up of a signalling connection from a user equipment 200 to the mobile communications network 170. The signalling connection, which can be either a circuit switched or packet switched connection, is set-up via a radio network element 210 to a pool network element 220. Such a set-up can be performed in each case the user equipment contacts the network, e.g.
- 10 15 either for or for the purpose of location update or call set-up, or for registering at the network, e.g. after the user equipment has been switched on.

The set-up outlined in the figure does not show the messages exchanged between the user equipment 200 and the radio network element 210 that are necessary to establish the radio connection itself between these nodes, as the invention does not refer to the so-called radio set-up, and as a person skilled in the art is familiar with it.

In order to support the set-up of the signalling connection, the radio network element 210 broadcasts a location information 230. The location information is specific for the area served by the radio network element. The location information broadcasted in the different location areas 150, 153, 156 shown in figure 1 is different each. The same principle applies in a packet switched domain for routing areas.

In a circuit switched domain, a location area information LAI as explained in figure 3a is broadcasted as location information. In a packet switched domain, a routing area information RAI as explained in Fig. 3b is broadcasted as location information. The location information 230 comprises a pool identifier identifying the pool 100 of network elements 110, 115 serving the location area.

If the user equipment 200 contacts the mobile communications network 170, i.e. if a message transfer or a communication is initiated, it sends via an air interface an initial transfer message 240 to the radio network element 210. The user equipment identifies itself towards the network 170 by a temporary subscriber identity, which can be part of the initial transfer message 240. In the circuit switched domain, the temporary subscriber identity can be the temporary mobile subscriber identity TMSI. In the packet switched domain, the packet temporary mobile subscriber identity P-TMSI can be used. Both TMSI and P-TMSI are explained with reference to figure 4.

The temporary subscriber identity assigned to the user equipment 200 is location area or routing area dependent. If the user equipment changes the area, another temporary subscriber identity is assigned. In one embodiment of the invention, the user equipment sends in addition with any transmission of the temporary subscriber identity an information, e.g. within the initial transfer message 240, from which location area or routing area the temporary subscriber identity has been assigned, in order to allow a network element of a different location area or routing area to retrieve eventually needed data from the corresponding network element that has the temporary subscriber identity assigned.

If the user equipment contacts the network for signalling purposes, it sends the initial transfer message 240. This can be e.g. the so-called initial direct transfer message, which is described in 3GPP TS-25.331 V 3.5.0. The initial transfer message 240 comprises a pool registration parameter, of which value indicates that the user equipment 200 is already registered in the pool that serves the area wherein

the user equipment is currently located, if the user equipment determines that the pool identifier received within the location information 230 and a pool identifier stored in the user equipment 200 are equal. The pool registration parameter value indicates that the user equipment is not registered in the pool if the received pool identifier and the stored pool identifier are not equal. Details of the determination of the pool identifier to be used by the user equipment 200 are explained with reference to figure 5.

- The initial transfer message comprises preferably the temporary subscriber identity.
- 10 Alternatively, the temporary subscriber identity might be sent as a separate message or within another message to the radio network element 210.

Preferably, the initial transfer message comprises furthermore a network element identifier that identifies that network element 220, at which the user equipment 160, 200 is registered. The dedicated network element 220 is identified uniquely within the pool 100 of network elements 150, 153, 156, 220, i.e. there are no duplicate network identifiers belonging to network elements 110, 115 within the same pool in the same domain.

20 Alternatively, the network element identifier can be sent in a separate message or within another message to the radio network element 210. As explained with respect to figure 4, the network element identifier can be comprised in the subscriber identity, e.g. in the TMSI or P-TMSI. Alternatively, the network element identifier can be included as a separate parameter within the initial transfer message.

25 The radio network element 210 determines as described with reference to figure 6 the pool network element 220, to which information given in the initial transfer message is at least partly to be routed within a signalling message 250. The initial transfer message 240 can be routed at all in the message 250 to the pool network element 220. Alternatively, the radio network element 210 might drop or add some signalling information for the further transmission. At least a mobile identifier and a

higher layer information can be transmitted further, e.g. a location area update request itself.

The routing of the signalling message 250 can be performed via a direct connection
5 from the radio network element 210 to the pool network element 220. In an alternative embodiment, the routing can involve a plurality of network nodes, which are transparent, i.e. without effect, to the message 250 itself. At least, the pool network element 220 receives the signalling message 250 and takes care for the further processing.

10 Fig. 3a shows a preferred embodiment of the structure of the location information, which is in a circuit switched domain broadcasted from a radio network element of the communications system. The overall format corresponds to the location area information LAI as defined in 3GPP TS-23.003 V 3.7.0. The LAI as already known
15 comprises 3 digits for a mobile country code MCC identifying a country, 2 or 3 digits for a mobile network code MNC identifying a mobile network, and 2 octets, i.e. 16 bits, for a location area code LAC identifying a location area. According to a preferred embodiment of the invention, the LAC is divided into a pool identifier PID identifying uniquely within a mobile communications network 170 a pool 100 comprising network elements 110, 115, and into a location area identifier LAID identifying a location area. More preferably, the PID and the LAID have a length of 8 bit each. Therefore it is possible to address up to 256 different pools 100 per mobile communications system 170, and to address up to 256 different location areas per pool 100.
20

25 Fig. 3b shows a preferred embodiment of the structure of the location information, which is in a packet switched domain broadcasted from a radio network element of the communications system. The overall format corresponds to the routing area information RAI as defined in 3GPP TS-23.003 V 3.7.0. The structure of the
30 location information used in a packet switched domain of a communications system

corresponds in the invention to the structure as described with reference to figure 3a apart from an additional octet comprising a routing area code RAC.

- Fig. 4 shows a preferred embodiment of a temporary subscriber identity, which
- 5 identifies uniquely and temporary a subscriber within a location area or routing area. The overall format corresponds to the temporary mobile subscriber identity TMSI for a temporary subscriber identity in a circuit switched domain, and it corresponds to the packet temporary mobile subscriber identity P-TMSI for a temporary subscriber identity in a packet switched domain, both as defined in 3GPP TS 23.003
- 10 V 3.7.0. The temporary subscriber identity has preferably a length of 32 bit and comprises a domain indicator D having 2 bits indicating a circuit switched domain or a packet switched domain, a reallocation field G for reallocation data, e.g. for a restart counter, which is used to cope with a reallocation policy as known from TMSI/P-TMSI. Further comprised is a network element identifier NEI to identify a
- 15 network element within a pool of network elements and a subscriber identifier SID to identify a mobile subscriber within a network element, e.g. within a MSC/VLR or SGSN. In a preferred embodiment of the invention the G has 5 bits, NEI has 5 bits, and SID has 20 bits.
- 20 Fig. 5 illustrates a set-up of a signalling connection by a user equipment 160, 200 to a mobile communications network 170. The shown example illustrates the case that the user equipment contacts the network for a location area update or a routing area update. Another example (not shown) for a user equipment that contacts the network is a call set-up.
- 25 In step 500, a first pool identifier PID, which identifies a pool 100 of network elements 110, 115 220 of the communications network 170, is received, which is sent e.g. from a radio network element via a broadcast channel. In step 510, a pool registration parameter PRP is determined by comparing the first pool identifier with
- 30 a second pool identifier PIDSIM, which is stored in a memory of the user equipment 160, 200, e.g. on a SIM card.

As explained in the table 560 shown in figure 5, PRP is set to '0' if PID is not equal to PIDSIM. In this case, the user equipment 160, 200 is currently not registered in the pool 100. PRP is set to '1' if PID is equal to PIDSIM. In that case, the user equipment 160, 200 is currently registered in the pool.

The user equipment 160,200 sends an initial transfer message to a radio network element 150,153,156, 210 of the mobile communications network 170, wherein the initial transfer message comprises the pool registration parameter PRP. In the shown embodiment, a temporary subscriber identifier is additionally comprised in the initial transfer message. The temporary subscriber identifier can comprise a network element identifier NEI. In an alternative embodiment, a temporary subscriber identifier is partly comprised in the initial transfer message. E.g., the initial transfer message can comprise the network element identifier NEI without the rest of the temporary subscriber identifier.

In an alternative embodiment, the network element identifier is sent to the radio network element by another, e.g. a separate message.

In the shown embodiment of figure 5, the stored pool identifier PIDSIM is updated with the received, i.e. currently valid, pool identifier PID. In a further embodiment, this update can depend on a positive acknowledgement of a location update by the communications network.

Fig. 6 illustrates a set-up of a signalling connection originating from a user equipment 200 by a radio network element 210 to a network element 220 of a pool 100 of network elements. The radio network element receives in step 600 an initial transfer message that comprises a pool registration parameter PRP, which indicates, whether the user equipment is already registered at the pool, and at least the network element identifier NEI. In the shown example the NEI is comprised in the temporary

subscriber identifier. Alternatively, the NEI can be provided in another message or within a separate message.

- By use of the PRP it is determined, to which network element of the pool 100 of
- 5 network elements 150, 153, 156 the signalling connection is to be set-up. In step
610 it is checked, whether the PRP equals the value '0'. The value '0' indicates as
shown in the table 560 of figure 5 that the user equipment 160 is not registered at
the pool 100. The radio network element chooses in step 630 a network element,
e.g. by selecting a valid NEI of the pool network elements. The choice can be
- 10 performed e.g. based on a load sharing algorithm, randomly or by a round robin
algorithm. As the PRP indicates that there is no existing pool relation, any NEI that
has been received within the initial transfer message does not need to be considered
for the determination of the network element, to which in step 640 the initial
transfer message is routed.
- 15 If the PRP does not equals '0', the user equipment is supposed to be registered at the
pool 100. In this case the NEI is read in step 620, e.g. from the temporary subscriber
identifier. The network element that is addressed by the NEI is determined as that
network element, to which the initial transfer message is routed in step 640.
- 20 In a further embodiment (not shown in the figure) the temporary subscriber identity
and the network element identifier are stored in relation to each other, e.g. within a
lookup table, for further routing transactions.
- 25 In a further embodiment the method as explained with reference to figure 6
comprises in addition the broadcasting of the location information as described with
reference to figure 2.
- 30 Preferably the same network element takes care for the task of broadcasting of the
location information and for the task of routing the initial transfer message.

Without being limited to, the invention can be used preferably in all communications systems as defined by 3GPP in the release 99 as well as in all future releases thereof. In particular, this includes UMTS networks, core networks, GSM networks and the corresponding user equipment.

Claims

1. Method of supporting a set-up of a signalling connection, wherein a radio network element (150,153,156;210) of a mobile communications network (170)
5 broadcasts in a dedicated area a location information, which comprises a mobile country code, a mobile network code and an area identifier,
characterised in that
the location information comprises at least one pool identifier identifying at least one pool of network elements serving the area.

10

2. Radio network element of a mobile communications network (170) adapted to broadcast in a dedicated area a location information, which comprises a mobile country code, a mobile network code and an area identifier,
characterised in that
- 15 the location information comprises at least one pool identifier identifying at least one pool of network elements serving the area.

3. Method of setting-up a signalling connection by a user equipment (160; 200) to a mobile communications network (170), wherein the user equipment (160;200)
20 sends an initial transfer message to a radio network element (150,153,156; 210) of the mobile communications network (170),
characterised in the steps of
 - receiving a first pool identifier identifying a pool (100) of network elements (110,115; 220) of the communications network (170),
 - 25 - determine a pool registration parameter by comparing the first pool identifier with a second pool identifier stored in a memory of the user equipment (160; 200), such that the pool registration parameter indicates that either the user equipment (160; 200) is already registered in the pool (100) if the received pool identifier and the stored pool identifier are equal, or that the user equipment (160; 200) is not
 - 30 registered in the pool (100) if the received pool identifier and the stored pool identifier are not equal,

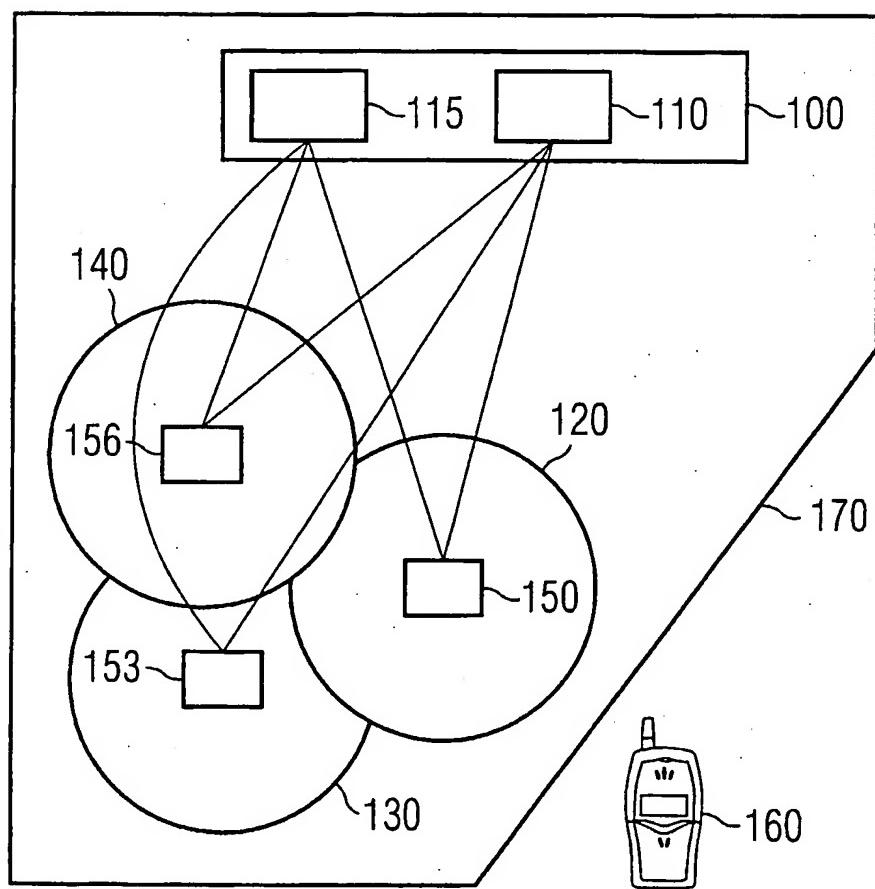
wherein the initial transfer message sent to the radio network element (150,153,156; 210) comprises the pool registration parameter.

4. Method according to claim 3, wherein the user equipment (160; 200) sends to the
5 radio network element (150, 153, 156; 210) a network element identifier that identifies a dedicated network element (220), at which the user equipment (160; 200) is registered, wherein the dedicated network element (220) is identified uniquely within the pool (100) of network elements (150,153,156; 220).
- 10 5. Method according to claim 3 or 4, wherein the second pool identifier is replaced in the memory by the first pool identifier.
- 15 6. Method according to claim 4 or 5, wherein the network element identifier is sent to the radio network element within a temporary subscriber identity (TMSI, P-TMSI) that comprises a domain indicator, reallocation data and a subscriber data identifier.
- 20 7. User equipment of a mobile communications network adapted to perform a method according to any of the claims 3 to 6.
- 25 8. Method in a communications network of setting up a signalling connection by a radio network element to a network element of a pool of network elements, wherein the radio network element receives an initial transfer message and routes information given in the initial transfer message at least partly to the network element,
characterised in the steps of
 - receiving a pool registration parameter indicating a pool registration status of a user equipment,
 - determining by use of the pool registration parameter that network element of the
30 pool of network elements, to which the signalling connection is to be set-up, and wherein the routing is performed to the determined network element.

9. Method according to claim 8, wherein the determination of the network element is performed by choosing one network element of the pool by the radio network element, if the value of the registration parameter indicates that the user equipment
5 is not registered at the pool.
10. Method according to claim 9, wherein a network element identifier is received, that identifies uniquely a dedicated network element of the pool, at which the user equipment is registered, and wherein the dedicated network element is determined.
10
11. Method according to claim 10, wherein the network element identifier is received within a temporary subscriber identity (TMSI, P-TMSI) that comprises a domain indicator, reallocation data and a subscriber data address.
- 15 12. Method according to claim 11, wherein the temporary subscriber identity and the network element identifier are stored in relation to each other for further routing transactions.
13. Method according to any of the claims 8 to 12, performing in addition the
20 method according to claim 1.
14. Radio network element adapted to perform a method according to any of the claims 6 to 13.
- 25 15. Computer program, loadable into the internal memory of a digital processing unit, comprising software code portions adapted to control the steps according to any of the claims 1, 3 to 6, 8 to 13, when the computer program is executed on the digital processing unit.
- 30 16. Computer program according to claim 15, wherein the computer program is stored on a computer-readable medium.

1/4

FIG. 1



2/4

FIG. 2

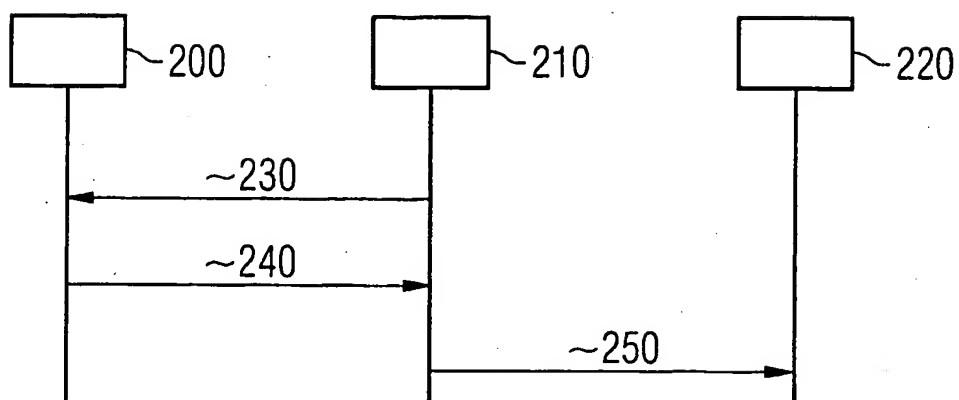


FIG. 3a

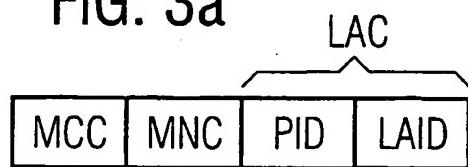


FIG. 3b

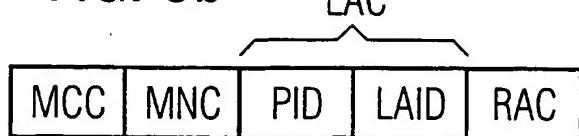
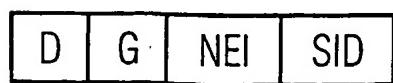


FIG. 4



3/4

FIG. 5

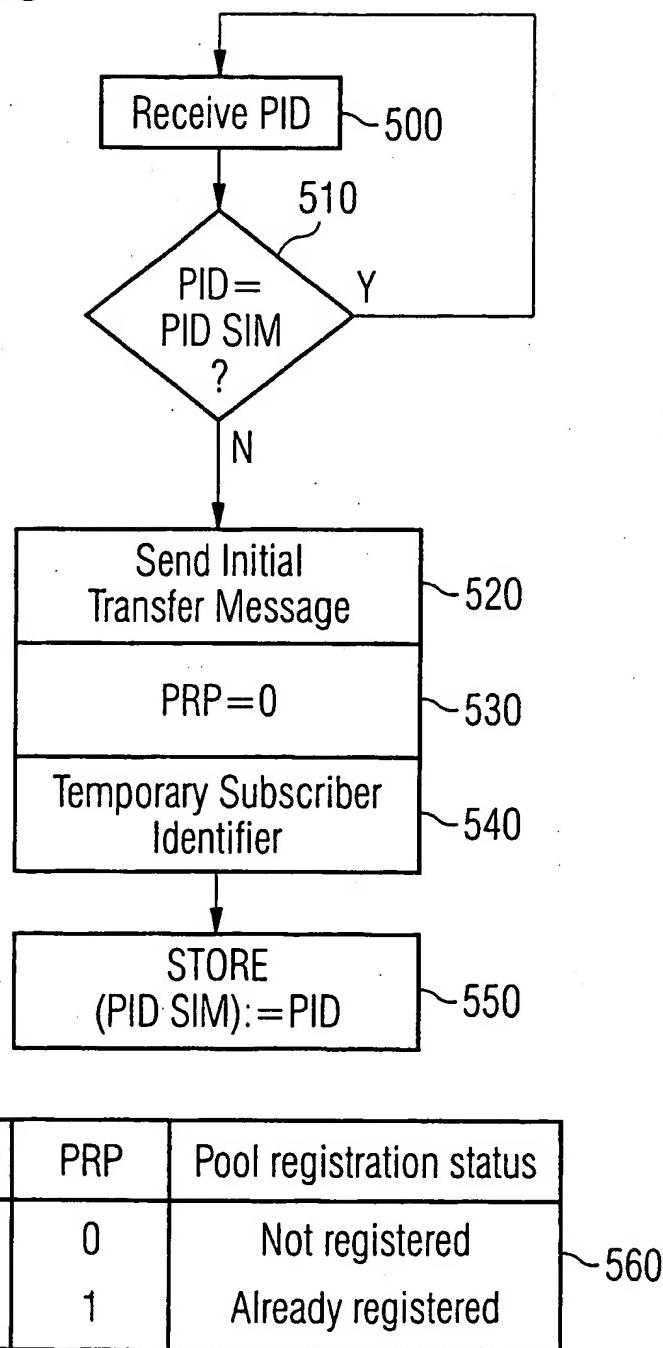
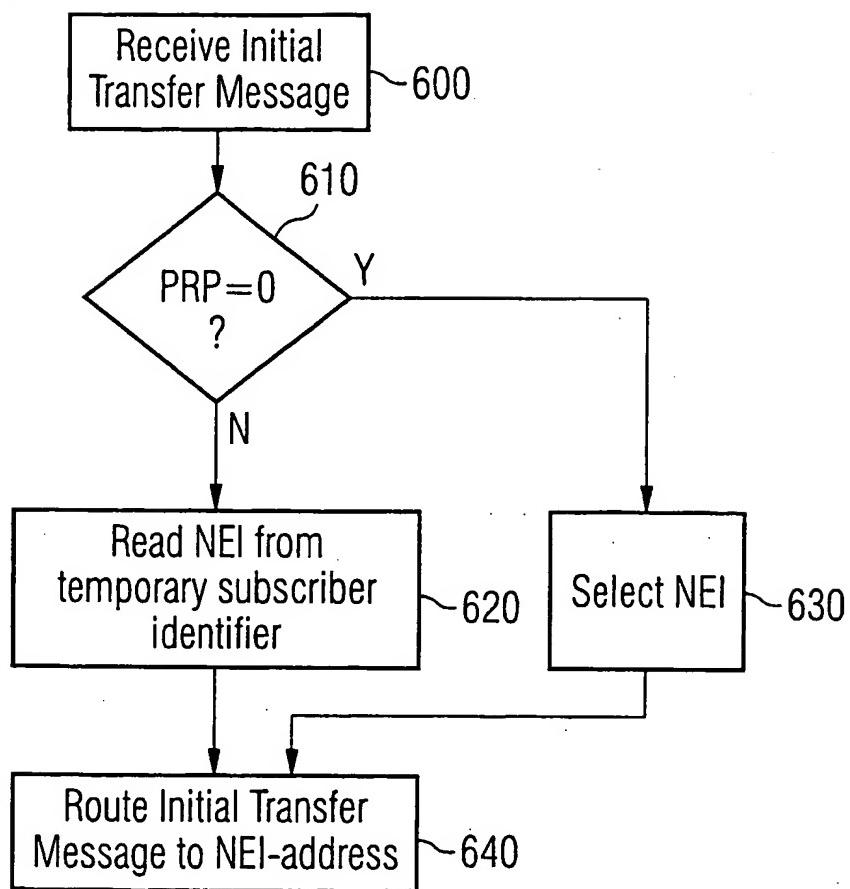


FIG. 6



INTERNATIONAL SEARCH REPORT

onial Application No

PCT/EP 02/01598

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 H04Q7/38

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 H04Q

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, IBM-TDB, COMPENDEX, INSPEC, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 6 097 951 A (REECE CHRISTOPHER S ET AL) 1 August 2000 (2000-08-01) column 7, line 55 -column 8, line 31 column 8, line 52 - line 61 column 9, line 46 - line 67 ---	1,2
Y	US 5 305 466 A (TAKETSUGU MASANORI) 19 April 1994 (1994-04-19) column 8, line 3 - line 34 column 8, line 42 - line 49 column 9, line 25 - line 42 ---	3-16
Y	WO 00 28771 A (ERICSSON TELEFON AB L M) 18 May 2000 (2000-05-18) page 8, line 14 - line 25 page 9, line 7 - line 14 ---	3-16
A	-/-	1,2

 Further documents are listed in the continuation of box C. Patent family members are listed in annex.

* Special categories of cited documents :

- *A* document defining the general state of the art which is not considered to be of particular relevance
- *E* earlier document but published on or after the International filing date
- *L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- *O* document referring to an oral disclosure, use, exhibition or other means
- *P* document published prior to the International filing date but later than the priority date claimed

T later document published after the International filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

X document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

Y document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

& document member of the same patent family

Date of the actual completion of the international search

Date of mailing of the international search report

2 July 2002

09/07/2002

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel: (+31-70) 340-2040, Tx: 31 651 epo nl,
Fax: (+31-70) 340-3016

Authorized officer

Rüschiemann, F

INTERNATIONAL SEARCH REPORT

International Application No
PCT/EP 02/01598

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 6 101 388 A (KESHAVACHAR BHAKTHA) 8 August 2000 (2000-08-08) column 4, line 7 - line 41 -----	3,5,7,8
A	US 6 091 953 A (ERNAM HAKAN ET AL) 18 July 2000 (2000-07-18) column 2, line 40 -column 3, line 62 column 6, line 25 - line 49 column 9, line 11 - line 23 -----	4,6-8, 10,11, 13,14

INTERNATIONAL SEARCH REPORT

Int'l Application No
PCT/EP 02/01598

Patent document cited in search report		Publication date		Patent family member(s)	Publication date
US 6097951	A	01-08-2000	AU BR CA CN EP WO US US	8823598 A 9810976 A 2301180 A1 1290459 T 1013114 A2 9908392 A2 6148201 A 6091953 A	01-03-1999 08-08-2000 18-02-1999 04-04-2001 28-06-2000 18-02-1999 14-11-2000 18-07-2000
US 5305466	A	19-04-1994	GB JP JP JP JP	2243976 A ,B 2947263 B2 10248085 A 2800455 B2 5003581 A	13-11-1991 13-09-1999 14-09-1998 21-09-1998 08-01-1993
WO 0028771	A	18-05-2000	US AU WO	6275706 B1 1591200 A 0028771 A1	14-08-2001 29-05-2000 18-05-2000
US 6101388	A	08-08-2000	NONE		
US 6091953	A	18-07-2000	US AU BR CA CN EP WO US	6148201 A 8823598 A 9810976 A 2301180 A1 1290459 T 1013114 A2 9908392 A2 6097951 A	14-11-2000 01-03-1999 08-08-2000 18-02-1999 04-04-2001 28-06-2000 18-02-1999 01-08-2000